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Diversification Strategy and Factors Affecting Production of Sugar in Kenya

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ABSTRACT

The project involved an investigation into the dimensions affecting production of sugar and its diversification in Kenya and how it's pursued by different sugar processing and marketing factories. An inquest in understanding competitiveness between industry players has primarily been pursued in accordance to economic, surrounding and market conditions. This research integrated perspectives of strategic management on the resource based view of factory performance to formulate a theoretical model of factors affecting production of sugar and its diversification. The main objective of the paper was to analyze factors affecting sugar production and its diversification in Kenya. The objective was anchored on predetermined variables of dimensions for establishing a sugar factory. The factors included technological capability, materials capability and financial capability. The paper employed cross sectional survey methodology by applying factor analysis of comparison between different sugar factories in Kenya. A series of prepositions were presented on the factors identified as influencers of production of sugar and its diversification in Kenya. The study results revealed that there exist a major interdependency between the variables of organization technological, material and financial capabilities on sugar production and its diversification in Kenya. The researchers considered the varied approaches of diversification for performance improvement and outlined implications for further research, policy and practice.

Key Words: Factors of Production, Sugar Production and Diversification

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Introduction

Globally sugar is considered a strategic commodity with a multifunctional input in economic and social improvement of producing nations and enjoys immense protection and privileged trading treaties operated through special waivers by World Trade Organization (WTO). In order for sugar sector to remain competitive, factories are focusing on improving factors of sugar production and its diversification.

Sugar is produced in 127 States in the World and only 70% of sugar tonnage produced is consumed locally in its origin of production. 30% of worldwide sugar output is traded internationally, out of this only 20% is traded through future contracts and the balance through bi-lateral and privileged trading arrangements. The worldwide sugar market is therefore a remaining market, with prices, that is not proportional to the expenses of manufacture. The global sugar supply indicates a negative deficit compared to its demand which is attributable to increase in its uninterrupted and indirect utilization. The financial statistics of 2015/16 reflected the production of 174 million tonnes against total consumption of 180.7 million tones, thus projecting a deficit scenario of 6.7 million tones which resulted to the current high prices of the commodity on the global market (KSB, 2017).

Sugar industry in Kenya is currently faced with grave problems that include high costs of inputs and stiff competition from low cost manufacturers (KSB, 2017). The current state of sugar sector is primarily as a consequence of destructive political policies that have seen corruption, mismanagement and shortage of partisan goodwill ruins the sector (SCAM, 2002). The consequence results are a perennial increase in insufficiency levels amongst farmers and subsequent decline in a maintainable competitive gain and growth of the sub-sector (Barney, 2006). The condition has been worsened more by non-sequenced trade liberalization treaties. This policy has contributed to uncontrolled influx of imported (often dumped) sugar into the national market. The sector is presently operating under COMESA safeguard measures which will terminate in February 2018. There is an urgent need for radical reforms and scanning of the turbulent competitive landscape for the industry all the stakeholders (Peteraf, 2003).

Kenya Sugar segment is destined to undertake key reforms in several aspects to build competitiveness and introduce effective governance in the commodity supply chain. Sugar from the international market and other low cost manufacturers such as Malawi, Zambia and Swaziland who are members of COMESA and SADC trading blocks, pose a great threat to Kenya sugar segment survival attributable to zero tariff tax regimes operated by COMESA that allows free motion of sugar within member states. Kenya is presently enjoying a temporarily protection through a COMESA safeguard that was granted to allow Kenya build its economic advantage until 2018 when the safeguard measure will be lifted. In Kenya, sugarcane is grown on fairly flat areas of Western and Coastal regions of Kenya. By the year 2015, there were fifteen (15) major sugar factories with an annual production capacity of 592,034 tonnes of

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sugar (KSB, 2015).

In Western Kenya, sugar cultivation is practiced in Kakamega, Bungoma, Busia, Migori, Homabay and Kisumu counties. While in the coastal region, sugar factories are found in Kwale and Kilifi counties. Sugar factories in the country have the potential to produce more products besides brown and white sugar (KSB, 2015). And if an industry is to produce enough sugar and co-products to satisfy ever increasing local and global markets; good diversification strategies and utilization of factory capabilities for competitive edge should be implemented.

The researchers are with the opinion that all shareholders in sugar manufacturing, including the government ought to participate in insuring that our companies do not collapse due to uncontrolled competition, thus affecting livelihood of many citizens. According to Nyangi et al (2015) there exist a correlation between firm capacities and production of sugar factories. However, for Kenya to develop into a second class income economy by the year 2030 (Kenya-Vision 2030, 2007), the short-term plan for the government is to revamp several sectors through diversification, focus on competitive advantage strategies and create a friendly investor atmosphere for domestic proprietors, diaspora and multinational investors.

Overview of the Sugar Sector in Kenya

The introduction of sugarcane husbandry in Kenya started in 1922, with the erection of Mumias Sugar Company Limited as the leading government owned factory (MSC, 2015). The industry funds directly or indirectly approximately 5 million Kenyans representing almost 16% of the whole population. Sugar cane growing is also a main source of livelihood to more than 150,000 stakeholders (Odenya, et al., 2007). It also offers livelihood and employment to approximately 75% of the rural population (KSB, 2015). Indicators display that Kenya's intake of sugar outstrips production. Therefore, any government transformation in the sector, attributable to its dominance will translate to transformation in the whole economy. Henceforth, additional investment in this sector still remains a priority to stakeholders.

In 2015, Kenya produced about 70% of her national sugar requirements. As sugar production increased, consumption also increased. The deficit in sugar production is clinched through imports. Kenya poses of unexploited Tana delta arable land on coastal region; there exist a possibility of the country sustainably become self-sufficient in sugar production and even with surplus for export. There were fifteen (15) registered large sugar manufacturing factories in Kenya by 2015.

Based on supply and demand for the products, it's clear that significant changes and investigation on increasing the performance and competitiveness of this segment is still a key national priority (KAM, 2015). The aggregate sugar manufactured in Kenya for the year 2015 was estimated at 592,034 tons with Mumias Sugar Company contributing 19% of the aggregate production, West Kenya Sugar

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Factory at a production of 12.45%, Nzoia Sugar Factory accounting for 11.23%, South Nyanza Sugar Factory at 10.14%, while Transmara Sugar Company at 9.95% of the aggregate production. Today, Muhoroni which used to produce 9% of the aggregate production is under receivership and is currently operating at under-capacity.

New players like Butali Sugar factory, Sukari Sugar factory and Kibos Sugar factory have joined the industry (KSB, 2015). Apart from the sector meeting its domestic consumption, Kenyan companies have a window of opportunity to benefit from annual export quota to the European Union. This follows the country status after being granted the class of an exporting member of the International Sugar Organization (ISO). There also exists a potential market in the COMESA and Intergovernmental Authority on Development (IGAD) regions (Kenya-Vision 2030, 2007). With increasing sugar consumption, the hasty growing population and the existing export potential, further production expansion is necessary in the sector and these invites for more investment from both local and global investors.

The researchers therefore, sought to study on how sugar factories can improve performance through product and market diversification, capitalization on existing modest advantage based on clearly focused strategy. Factories venturing into non-traditional products, for example co-generation, bio-fertilizer and ethanol, intensifying promotion of brown sugar and white sugar locally and internationally and improvement of customer service throughout the organizations are vital for the survival of the industry.

Literature Review

The paper is anchored on the theory of resource based view (RBV) (Wernerfelt, 1984). RBV is one of the greatest and widely recognized theoretical perspectives in the arena of strategic management in discussing factory performance (Barney, 1991; Hamel & Prahalad, 1990). RBV as a basis for factory performance and its diversification lies primarily on the utilization of a group of expensive physical or service capabilities at the firm's disposal (Wernerfelt, 1984; Penrose, 1959). The paper applied the theory to describe the relationship between technological capacity, material capacity and financial capacity on sugar production and its diversification. The RBV conceives that existence of unique resources and capabilities and its deployment patterns as the root course of factory's competitive edge and superior performance (Grant, 1991; Tokuda, 2005). A sugar factory that effectively manages the intelligence about its consumers and technologies posts superior products compared to competitor's performance.

The RBV stipulates that resources are categorized into strategic and non-strategic resources. Non-strategic assets do not contribute to longstanding success of the factory (Wernerfelt, 1984). Four conditions that jointly define the features of strategic assets are; rare, expensive, imperfectly inimitability and non-substitutable. Thus, to record high performance and long-term competitive edge, firms should establish strategic assets.

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Technological Capability on Sugar Production and Diversification Strategy

Leveraging on sugar production technology and innovation are some of the indicators of technological capability. Of all the factors of production necessary in registering a better performance, technological advancement plays the most visible responsibility (Khalaji, 2014). This explains why Perrow (1967) defined technology as a system that ensures that the work is done. Therefore, Scholarly investigations into technical capability of the sugar factory have resulted to a better synthesis of the technical change process.

Oruwari, Jev and Owei (2002) defined technological capability as the resources required to purchase, assimilate, utilize, impress, reform or grow a new technology. Lall (1992) stressed the vigor of technological strength as the way factories feed, process, formulate, reform and generate new feasible technical systems (technology, process, products and procedures) within the expertise frontier (Zawislak, Alves, Gamarra, Barbieux, & Reichert, 2012). To continue operating in a selected market, the factory must manufacture some rare solutions, which is recognized as such by the consumer. Technological advancement of a factory highly revolves on a blend of internal and outside advancement: internal advancement comes about by the organizational growth of innovative products and through interior research and growth processes, external advancement thrives on technology acquired through technological strategic alliances (Oruwari et al., 2002).

While Livernthal and March (1993) postulate that factories with a better technological capability in a given sector are usually motivated to search more domestic, regional information and elicit their prevailing intellectual merchandise to achieve immediate advantage (Zhou & Wu, 2010). As the factories accumulate its intelligence in a technological field, it becomes more competent in adopting external intelligence in similar fields because of the positive response between expertise and growth. These should improve efficiency (factory capacity utilization and overall sugar extraction in the instance of the sugar industry) and produce reliable outcome in firm performance. In advanced manufacturing technology companies, investments are undertaken every year because proprietors perceive a figure of benefits that are directly attributed to it namely; reduced cycle-time, increment of market share, improvements towards zero-defects, return on equity and planned production (Kotha & Swamidass, 1998).

Factories invest seriously in the installation of technological competences that offer the skills and aptitudes to arrange and utilize various resources and know-how. Afuah (2002) states that when a factory shapes its technological capability, it invests substantial investment in research and development (R&D), which involves the discovery of innovative products, the buildup of intellectual stores, and the training of technical personnel (Zhou & Wu, 2010). A company's technological capability is advanced over time and amassed through its past experience. It is widely documented in the theoretical

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literature that factories are obligatory to utilize both internal and external sources of novelty aimed at recording a higher production.

Nelson (1991) and Cabral (2010) suggested that factory sustainability for competitive edge is influenced by the level to which the factory is capable of formulating capacities for continuous developments. Sustainability of inventions by a company indicates both the financial programs, social and ecological initiatives entrenched on innovation, whereas innovation competence shows the centres of information to acquire that sustainability. While Baark, Lau, Lo and Sharif (2011) survey of 200 processing factories in Pearl River Delta region and Hong Kong, found out that organizational environment constitute a major influencer of innovations that factories use to build technological capabilities, although external environment may be key when moderated by expertise in resource apportionment, marketing and control. The technological advancement of the factory leads to technical transformation that supports a successful innovation process (Zawislak et al., 2012).

Material Capability on Sugar Production and Diversification Strategy

Sugar or sucrose is a starch that grows naturally in every fruit or vegetable. It is the major product of photosynthesis reaction, a process by which plants covert sun energy into food. Two plants that produce large quantity of sugar are sugarcane and sugar beets. In reference to the context of this paper, sugarcane yield is the main raw material required for a factory in sugar industry. The production is measured by the sugarcane agricultural practices, harvesting techniques and haulage methods. Material capability of each factory may be distinct as the capacity to forecast and continuously receive enough material for maximization of crushing capacity operations over a long milling programme (Zimmermann & Zeddies, 2002). A reasonable proportion of sugar production costs accrue from the material costs, which accounts for 40 to 70 % of the whole production costs and range from 120 DM per tonne of sugar in Brazil to approximately 720 DM in Germany (Zimmermann & Zeddies, 2002). The statistics are not in any way different from the Kenyan context.

A properly-integrated supply chain in sugar manufactures can produce frugalities of scale and scope. It also leads to an increase in the working efficiency and profitability of all players in the supply chain. Sugarcane farming is a labour intensive crop as almost 50% of the investment costs are spent on labour. Machine expense is second in hierarchy while fertilizers, dung and seed cane have important demands on the farmer's coffers. The rate of return on sugarcane investment is calculated by the husbandry practice and timeliness of input application on the crop. In sugar producing nation setups, farmers and millers usually establish an interlinked contracts and these assists the cultivators to access credit, transport, inputs and guaranteed purchases (Zimmermann & Zeddies, 2002; Kokeyo, 2013). The contracts assures high yield of sugarcane and timely delivery. However, such agreements call for efficient co-ordination for achievement of a high

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productivity of sugarcane of both being delivered to the mills and the turf in order to avoid sugarcane shortage and downstream chain middlemen for sugar distribution.

Factory sugarcane supplier development program contributes to unremitting performance improvement in sugarcane supply. The continuous rise in the importance of agreement farming has largely been cause by alteration in global markets, where competition, shopper demands, skill, government policies and cane husbandry systems (Kokeyo, 2013). According to Chidoko and Chimwai (2011), governments usually apply some control on the sugar source process and hence milling factories must develop its source chain plans to remain relevant in dynamic markets. Further, Chidoko and Chimwai continued argue that if farmers do not receive good supervision services they are probable to record very high production costs and lower per land acreage output. Sugar yield per tonne cane is dependent on mill efficiencies and cane quality.

Cane quality is affected by good agronomic practices (sugarcane husbandry and harvesting practices), timely delivery to sugar mills and weather conditions apart from the submission of the right amount of fertilizer and pest/disease invasions control. The above conditions subsidize toward the competitive advantage of the factory. Currently the major sugarcane varieties grown in the country are N 14, CO421, CO 617 and CO 945 which occupy approximately 82% of sugarcane population (Wawire et al, 2006; Odenya, 2007). According to the Kenya Gazette No. 2070 of 2007, KESREF introduced four improved varieties namely; D8484, KEN 82-472, EAK 73-335, KEN 82-62. The supply of cane to the factory is affected by cane production costs, funding of the industry, research and extension services to support the industry and increase per acre tonnage. Waswa, Onyango and Mcharo (2012) established that the yield was a key determinant of gross revenue to farmers though the net revenue was ominously depressed by factory-driven supposition for which the farmers had no control.

Hence, availability of cane is determined by factors that motivate or demotivate the small scale cultivators who supply the majority of cane to millers in Kenya. The sugarcane harvesting consists of cutting the sugarcane stalk (near the ground) and cleaning the vegetal excess (trash). Manual cane harvesting consists of human being cutting the sugarcane stalk utilizing a “cane knife”. The cane may be harvested green or burnt. Sugarcane harvest coordination frequently contributes to co-ordination problems between the different operations being performed and the different shareholders who are involved, such as cutters, growers, haulers and millers (P-Y, Le Gal, & Requis, 2002). Sugarcane transportation operation consists of taking the harvested sugarcane to the sugar mill, where it will be processed.

Construction and continuous maintenance of tangible infrastructure are important for fast economic growth and poverty eradication. Improved networks determine levels of production, job creation, access to markets and investment opportunities (Wasike, 2001). Sugar production in Kenya faces

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challenges of poor or non- adoption of good transport and road infrastructure (Odek, Kegode, & Ochola, 2003). Poor road network infrastructure contributes to high fleet maintenance costs with limited productivity which results in transporters billing higher transportation rates. High transportation costs increase the overheads of sugar production and hence uncompetitive sugar market price. Barney (1991) and Nyangi et al (2015) argued that organization capabilities include all the assets, capabilities, processes, information and knowledge that are owned by the firm.

Financial Capability on Sugar Production and Diversification Strategy

Achieving fiscal results wants an organization to precisely balance its consumption within the limitations of its revenue stream. Real support and direct operations cost control, forecasted revenue utilization and monitoring of emerging financial issues is essential (Adeyemi, 2011; Memba & Nyanumba, 2013). Therefore, financial plans and budgets must be supple enough to allow for spending patterns to be adjusted as needed and be fully aligned to the organization's strategic and service planning. Financial Structure (Total liabilities/total assets), leverage ratio (Debt/Equity), cash flow ratio (cash flow/Total liabilities) affect the financial success of the factory. Therefore, factories should consistently preserve the past in order to strategize and forecast for the future.

Financial capability is the opposite of financial distress. Adeyemi (2011) defined fiscal misery as a state in which an organization is having operational, managerial and financial distress. According to Chartered Institute of Management Accountants (CIMA) (2009), companies are converting their financial roles to be more efficient and to better support commercial resolution building by developing their finance professionals in strategic thinking. The magazine continues that developing people with the combination of finance competencies and business capabilities required for this important role is a challenge. Thus, it is achieved through promotion of professional ethics in financial reporting. Deloitte study of over 1,100 businesses across the globe found that financial management was changing from a demotivating, albeit necessary function of doing business to the most assuring levers of organization continuous improvement. In fact, without upkeep from the finance role in improving strategy and operations, companies face a tough and often losing battle in changing their business.

The finance masters apart from investing in strong financial capacities, they have added on acquisition of better business competencies to support company reforms and transformation (CIMA, 2009). A factory's capital structure simply refers to its combination of liability and fairness (Calabrese, 2011). The ideal investment structure may be defined as a combination of both liability and fairness that contributes to maximum shareholders value and general cost of factory capital being minimized. Calabrese (2011) further argues that an ideal investment structure is a critical decision for any business venture because of the impact such a decision has on a factory's capacity

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to manage its competitive market. The prevailing capital structure is one of the causes distressing the financial capability of a factory and is tightly associated to the ability of plants to fulfill the needs of various shareholders (Adeyemi, 2011). Therefore, management of debt executes an exact energetic part in the success of factories in sugar industry. Efficient management of debt guarantees that a factory has enough cash to pay all their suppliers on time.

Suppliers of consumables and other merchandise are paid on time and hence enable the factory to achieve its goals. Whenever a company's possessions surpass its fairness base, its statement of financial position is said to be leveraged. Financial effect is an evaluation of how much a firm employs shares and debt to finance its assets. As company debt rises, the financial leverage increases. It has been noted through different research that financial leverage has a positive interlink to company's financial performance (Rehman, 2013). Leverage sometimes denoted to as gearing allows an organization to raise the probable profits or losses on a position or investment beyond what would be possible through a direct investment of its own funds.

Most often it includes buying investment asset with lend funds, with the anticipation that the returns from the investment or the asset price appreciation will be more than the interests of the borrowed finances. While leverage increases profits when the revenues from the asset are in excess to the finances to offset the costs of borrowing, losses are enlarged when the opposite is experienced. Excessive power is a common denominator in most fiscal disasters (Adeyemi, 2011). A company that borrows a lot of money might face insolvency or payment default during a venture depression, while a less-leveraged company might survive. During fluidity scrutiny, cash flow data is more accurate than financial statement sheet or revenue report information.

Financial position report is usually static; determining a distinct topic in a specified period; while the revenue report has many subjective non-cash provisions such as pension contributions, depreciation and amortization. In contrast, the cash flow report accounts the fluctuations in the other reports and nets out the accounting artifice, focusing on what shareholders really care about: cash available for operations and investments. Mills and Yamamura (1998) stated that cash stream ratios which are most useful in financial projections fall under two general categories: solvency/ liquidity ratios and profitability ratios which measure a factory capacity as a going distress. Factory liquidity ratios are operating cash flow (OCF), funds flow coverage (FFC), cash interest coverage (CIC) and cash debt coverage (CDC).

Profitability ratios is the second category of financial measure that is used to gauge a factory's capability to operate on a continuing basis are cash flow adequacy (CFA), cash to investment costs and cash to total debt. Traditionally, working capital ratios have been applied to specify how much cash the company had at disposal on a single date. While cash flow ratios tests how much cash was earned over a long period

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and relate it to the short-term liabilities, indicating a go-ahead image of what competences the factory should secure commitments. Thus, sugar companies utilized their financial capabilities to pursue product development, market development, diversification and corporate social strategies in different levels (Maweu, 2016).

Diversification Strategies and Economic Value

Diversification means producing a wide variety of products, interests and talent so as to become more successful or reduce risks (Nickels, 2002). For many years the organization culture for non-alcoholic beverage industry has been that of diversification. In undertaking diversification, companies seek to insulate service while other companies work limited to one general category (NAS, 2002). Business positioning can be through variety-based, consistent low-cost, need-based, accessibility or a combination to satisfy the needs customers (Lowitt & Grimsley, 2009). A good factory strategy should deal with industry forces of potential competitors, customers and suppliers behavior and product/service substitute as a variation in a single force, usually calls for a business entity to diagnose the market place (Porter, 2008).

Companies have overtime strategized on how to secure themselves from economic recession or from commercial vagaries which can affect the success of their products and services. A common approach for many decades has been that of diversification. Factories have continuously been involved in addition of related/unrelated new products or service lines (Ansoff, 1987; Marangu, et al., 2014). The rationale for diversification is to lower the cumulative risk by reducing dependence on one or only a few products or service area (Campbell, Gould, & Alexander, 1995). Diversification strategies can include company growth of innovative products and markets, procurement services, strategic alliances, approval of new technologies, distribution and amalgamation of these options (Porter, 2008).

This assortment is resolute in functions of accessible opportunities and reliability with goals and competencies of the company. The highest degree of diversification occurs when organizational assets are utilized to model a financial portfolio (Juin & Brown, 2005). Diversification is categories into three levels, the first one is concentric diversification strategy is a technical resemblance between the millers, which means that the factory is in a position to influence its technical know-how to gain some advantage (Porter, 1991). For instance a factory that processes commercial sugar might choose to grow into consumable sugar to be sold by shopkeepers. The technology would be the same but the marketing strategy would have to change. Therefore, concentric diversification is where a firm diversifies into a related business (Arther, 2005). According to Maweu (2016), sugar factories have the potential of diversifying into electricity generation, ethanol production, sale of molasses to industrial and individual user and water bottling. The factory also tends to improve its market share and profits though introduction of the new product.

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The second option is horizontal diversification which is where company incorporates new ventures that are technically or commercially distinct to existing products, but which may request to elite customers (Porter, 2008). In a competitive market, this type of diversification is necessary if the present consumers are steadfast to the present merchandise and if the developed products that are of high quality and properly priced and marketed (Mintzberg, 1990). Moreover, the developed products are promoted to the same consumption market segment as the current products, which occasionally may result to firmness and flexibility. In short, this path tends to raise company's reliance on specified market targets. The parallel addition happens when a firm ventures in a different product with similar mechanization in production as its installed operations.

The third option is conglomerate/lateral diversification strategy is when a factory promotes new products that have different technology or commercial features with the current products, but with an appeal to new teams or consumers (Porter, 2008). Factory diversification has very limited linkage with the factory's present operations. Thus, the major goal in impressing such a strategy are first to advance the profitability and the competency of the factory and second to get an excellent admission in stock markets as the organization grows bigger. Even if the approach is very dangerous, it could also, if successful, provide increased development and performance. Maragu et al (2014) established that concentric diversification has a positive effect on sugar firm's competitiveness. Present technology for brewing of ethanol from biomass depends on the process of fermentation and distillation, and requires a feedback that has sucrose extracted from sugarcane and sugar beet or starch from wheat, corn and cassava.

Several reports have put in doubt the futuristic viability of the sugar industry in Kenya and other developing countries. It is widely agreed that the industry requires an immediate transformation. One of the key issues in the most comprehensive of these reports is the need to improve economic efficiency in the industry (Hildebrand, 2002; SCUM, 2002). At the farmers level, the reports considers small scale fields to be uneconomic and advocates for block farming to achieve better economies of scale.

International market for substitute basics of sustainable fuel has developed the urge to experiment with new feed stocks and create innovative systems for brewing of ethanol (Markides, & Williamson, 1994; Awino & Wandera, 2010). "Second generation" bio-fuels are basically fuels manufactured from cellulose and hemicellulose, which can be acquired from farming and forestry residuals and organic wastes. There are other emerging systems, such as gasification, that consequently produce hydrocarbons from biomass feed stocks such as sugarcane bagasse. A factory achieves competitive edge over its rivals if it's able to create more economic value than other competing firms (Barney, 1991). Kenyan sugar industry could develop to the level of the Brazilian sugar industry if it could improve in its economic value.

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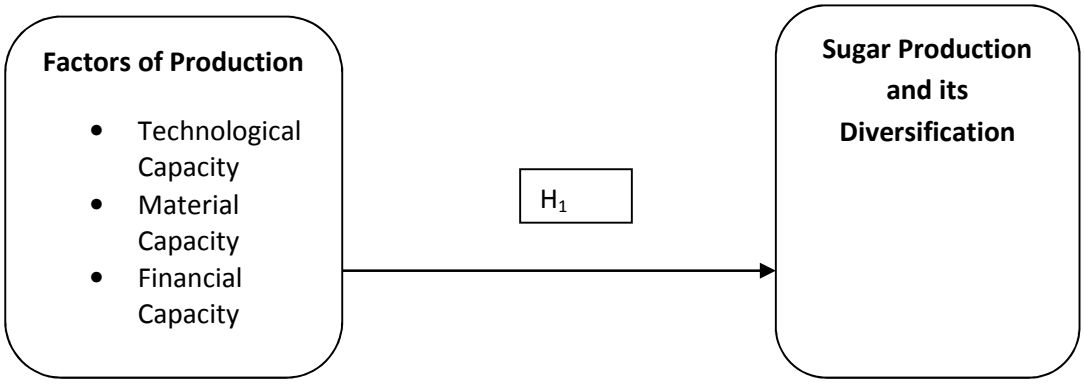
Conceptual Model



Source: Developed from Reviewed Literature by Authors (2017)

Figure 1: Conceptual Model

The framework in figure 1 focuses on the general objective of the paper which was analyze the factors affecting sugar production and its diversification in Kenya represented by H_1 The preposition of this research is that (factors of production) which is the independent variable has a significant relationship with (sugar production and its diversification) as the dependent variable.

Methods

The paper adopted a descriptive cross-sectional census survey. This is considered appropriate since the variables under study were measured as they naturally occur without being manipulated or controlled (Bryman and Bell, 2011). After data collection from all large scale sugar factories, the researchers organized the data; analyze it both quantitatively and qualitatively. This is in accordance to the logical coordination adopted for the paper because it will be concerned with investigations in what, when and how much of the phenomena at one point in time (Bryman, 2004; Cooper & Schindler, 2011). In this type of study, either the whole population or part is selected or from this sample, information is sought to assist respond research question of interest (Olsen & George, 2004). The paper focus was to collect information from respondents on their attitude and opinions in relation to factors affecting sugar production and its diversification in Kenya. The design is also appropriate because it adapts to previous research of Awino and Wandera (2010) which investigated a similar conceptual and contextual relationships.

The population of the study consisted of all large sugar manufacturing factories in Kenya who are registered members of Kenya Association of Manufacturers (KAM, 2015). The main rationale for sample selection was that these companies were

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likely to display an elegant management philosophy and make use of best management practices. Sugar sector is a sub-sector under the food and beverage manufacturing industry which comprises of companies involved in processing and marketing of consumable food products and beverages. There were a total of fifteen (15) large sugar factories in Kenya during the study period (KAM, 2015).

The paper used factor analysis to establish the factors affecting sugar production and its diversification in Kenya. This helped in reducing a number of variables into fewer factors which are of similar features. The mathematical model for the estimate of the jth factor Fj was: Fj = (WijXi = Wj1X1 + Wj2X2 + …… + WjpXp. Where: Wi's are known as factor score coefficients and Xi are the variables (i=1 to 22). To establish the nature and magnitude of the effects between the concepts and test the hypothesized relationships, the researcher used inferential statistics. To test hypothesis $H_{01,}$ $H_{01a,}$ H_{01b} and $H_{0c.}$ Pearson's Product Moment Coefficient (r) was computed. This measured the nature and strength of the relationship among the constructs, with r ranging from -1 to +1.

Results

Table 1 reveals that 3% of the respondents indicated very low, 2% were for low, 1% were not sure, 55% were for high while 39% indicated very high to the cognition that the availability of a good technology strategy to support business. Moreover, respondents showed that 31% of the respondents indicated very low, 50% were for low, 10% were not sure, 3% were for high while 5% indicated very high to the cogitation that the degree of technology advancement in the manufacturing.

Table 1: Factory Technology Level on Sugar Production and its Diversification

Statement	Very low	Low	Not sure	High	Very high
There is existence of a good technology strategy to support business	3%	2%	1%	55%	39%
There is high level of new technology use in the manufacturing	31%	50%	10%	3%	5%
There is high level of new technology application in the sugarcane transportation	39%	40%	3%	10%	8%
New technology has been adopted to enhanced the competitive advantage of the factory	5%	7%	8%	45%	40%
There are strategies to intensify refurbishment/replacement/maintenance to achieve overall technological capability	2%	5%	14%	40%	39%

Further the respondents indicated that 39% indicated very low, 40% were for low, 3% were not sure, 10% were for high while 8% indicated very high to the statement on use of high level of new technology in the sugarcane transportation. Likewise, 5% of the respondents scored very low, 7% were for low, 8% were not sure, 45% were for

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high while 40% indicated very high to the cogitation that new technology adopted has enhanced the competitive advantage of the factory. Finally, 2% of the respondents scored very low, 5% were for low, 14% were not sure, 40% were for high while 39% indicated very high to the cognition that there are strategies to intensify refurbishment/replacement/maintenance to achieve overall technological capability. Sugar production for the sector has been hampered by low adoption of agricultural technology, high cost of input and poor road network (Wawire et al., 2006).

Table 2: New Technology Acquisition on Sugar Production and its Diversification

Statement	Very low	Low	Not sure	High	Very high
There is improves product quality	4%	3%	5%	51%	39%
There is improves productivity	11%	5%	4%	48%	31%
There is improvement on existing production process	4%	10%	3%	45%	38%
Introduced new production process	5%	4%	8%	45%	43%
There is an improved competitive edge in COMESA Markets	6%	5%	10%	44%	43%
The factory positively responses to government regulation policies	2%	3%	14%	42%	39%

Source: Field Data, 2017

Table 2 reveals that 4% of the respondents showed very low, 3% were for low, 5% were not sure, 51% were for high while 39% indicated very high to the cogitation that new technology acquisition improves product quality. Moreover, respondents indicated that 11% of the respondents indicated very low, 5% were for low, 4% were not sure, 48% were for high while 31% indicated very high to the statement that new technology acquisition improves productivity. Further, the respondents indicated that 4% indicated very low, 10% were for low, 3% were not sure, 45% were for high while 38% indicated very high to the cogitation that new technology acquisition improves existing production process. Likewise, the respondents indicated that 6% of the respondents indicated very low, 5% were for low, 10% were not sure, 44% were for high while 43% indicated very high to the cognition that new technology acquisition improves competitive advantage in COMESA free trade area.

Finally, the respondents indicated that 2% of the respondents indicated very low, 3% were for low, 14% were not sure, 42% were for high while 39% indicated very high to the assumption that new technology acquisition

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improves response to government regulation policies.

Table 3: Material Capability

Statement	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
The factory does block cane harvesting in order to facilitate maximum fleet productivity	3%	4%	5%	35%	55%
The factory frequently holds trainings for cane cutters so as to improve cane quality and productivity of sugarcane cutters.	8%	2%	4%	20%	65%
The factory has implemented a performance incentive scheme other than task based pay for cane cutters to encourage good sugarcane harvesting	9%	43%	8%	15%	20%
The factory uses sugarcane inventory reports to ensure sustained optimal sugar cane supply	16%	39%	5%	10%	35%
Poor/ infrastructure pose serious sugarcane transport challenges to my factory	38%	44%	9%	10%	6%

Source: Field Data, 2017

Table 3 indicate that 7% disagreed, 5% were not sure while 90% agreed that the factory undertakes block cane harvesting in order to facilitate maximum fleet productivity. Further, 10% agreed, 4% were not sure 85% agreed that the factory frequently holds trainings for cane cutters so as to improve cane quality and productivity of sugarcane cutters. Moreover, 52% agreed, 8% were not sure 35% agreed that the factory has implemented a performance incentive scheme other than task based pay for cane cutters to encourage good sugarcane harvesting. Nevertheless, 55% agreed, 5% were not sure 45% agreed that the factory uses sugarcane inventory reports to ensure sustained optimal sugarcane supply. Finally, 82% agreed, 9% were not sure 16% agreed that poor infrastructure pose serious sugarcane haulage challenges to their factory.

Table 4: Research and Development

Statement	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Cane harvesting program is utilized to improve fleet productivity	8%	10%	9%	25%	50%
Field staff in charge of out grower extension monitors farmers activities and advise them on good method of sugar cane husbandry so as to promote optimal sugarcane yield	11%	5%	9%	20%	60%
Land preparation, seed cane and fertilizer supply are done/provided on time so as to enhance sugar cane yield	43%	20%	13%	10%	9%
Harvesting program is followed to control sugarcane age and sites to be harvested	20%	39%	5%	16%	25%
The factory invest in research and development so as to improve on productivity of sugarcane	38%	35%	9%	14%	11%

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Table 4 shows that 18% disagreed, 9% were not sure, 75% agreed that cane harvesting program is utilized to improve fleet productivity. Likewise, 16% disagreed, 9% were unsure while 80% agreed that field staff in charge of out grower extension monitors farmers' activities and advise them on good method of sugarcane husbandry in order to promote optimal sugarcane yield. Moreover, 63% disagreed, 13% were undecided while 19% agreed that land preparation, seed cane and fertilizer supply are done/provided on time so as to enhance sugarcane yield. Further, 59% disagreed, 5% were not sure, 41% disagreed that harvesting program is followed to control sugarcane age and sites to be harvested. Finally, 73% disagreed, 9% were undecided while 25% agreed that the factory invest in research and development to improve on sugarcane productivity.

Table 5: Sugar Cane Quality and Quantity

Statement	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Matching sugarcane availability to factory crushing capacity	12%	10%	5%	25%	50%
Factory practices annual sugarcane replanting to replace fallow farms	10%	5%	4%	25%	61%
Providing timely services and inputs to farmers	40%	23%	5%	18%	9%
Timely harvesting and transport of sugarcane to the factory	5%	30%	10%	40%	20%
Controlling tonnage of over mature sugarcane to avoid court cases	10%	5%	14%	29%	38%

Table 5 indicate that 22% of the respondents disagreed, 5% were unsure, 75% agreed that matching sugarcane availability to factory crushing capacity. Likewise, 15% disagreed, 4% were not sure, and 86% agreed that annual sugarcane replanting in order to replace fallow farms. Further, 63% disagreed, 5% were undecided, and 27% agreed that providing timely services and inputs to farmers. Moreover, 35% disagreed, 10% were not sure, 60% agreed that timely harvesting and haulage of sugarcane to the factory. Finally, 15% disagreed, 14% were undecided, and 67% agreed that controlling tonnage of over mature sugarcane to avoid court cases affected sugar production and its diversification. The results reinforce the need for Kenya Sugar Research Foundation (KESREF) to establish more demonstration plots in every location for farmers to embrace the features of new varieties and actively involve farmers in breeding programmes (Odenya, 2007).

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Table 6: Government Regulatory Policy

Statement	Very negative	Negative	Not sure	Positive	Very Positive
The government taxation regime in sugar industry is favorable	35%	47%	3%	11%	4%
There is lack of subsidy to sugarcane cultivators	55%	25%	9%	10%	2%
The exist good labor laws governing the relationship between proprietors and workmen	32%	40%	7%	10%	6%
There is non-enforcement of laws governing the conduct of millers and growers	26%	60%	7%	2%	5%

Table 6 shows that 82% of the respondents indicated negative, 3% were not sure, 15% indicated positive on the Kenya government taxation regime in sugar industry. On other hand, 80% indicated negative, 9% were not sure, 12% indicated positive that lack of subsidy to sugarcane cultivators affected the competitive advantage of Kenya sugar industry. The study further shows that 72% of the respondents indicated positive, 7% were undecided, while 16% indicated positive that the Kenya labor laws governing the relationship between proprietors and workmen. Finally, 86% of the respondents showed negative, 7% were undecided, while another 7% indicated positive that non enforcement of laws governing millers and growers affected sugar production and its diversification.

Inferential Statistics

As indicated in table 1, fourteen (14) variables were reduced into four (4) factors which explained 81.33% (Cumulative percentage) of the total variance, while the remaining ten (10) factors together account for 18.67% of the variance. The explained variance of 81.33% >70% hence factor analysis was adopted to select elements affecting sugar production and its diversification in Kenya.

Table 7: Total Variance Explained (Eigen values)

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.118	36.558	36.558	4.392	31.371	31.371
2	3.695	26.390	62.948	3.997	28.547	59.918
3	1.513	10.804	73.752	1.906	13.617	73.535
4	1.061	7.578	81.330	1.091	7.795	81.330
5	.784	5.598	86.928			

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6	.676	4.830	91.758			
7	.492	3.516	95.274			
8	.238	1.702	96.976			
9	.196	1.398	98.374			
10	.119	.847	99.221			
11	.054	.385	99.606			
12	.043	.307	99.913			
13	.010	.074	99.987			
14	.002	.013	100.000			

Extraction Method: Principal Component Analysis

The scree plot is a plot of total variance associated with each factor and shows a distinct break between steep slope of the large factors and gradually trailing off the rest of the factors.

The Scree Plot shows a four factor model would be sufficient (factors with Eigen >1) in the analysis, that is, 14 variables have been reduced into four distinct factors

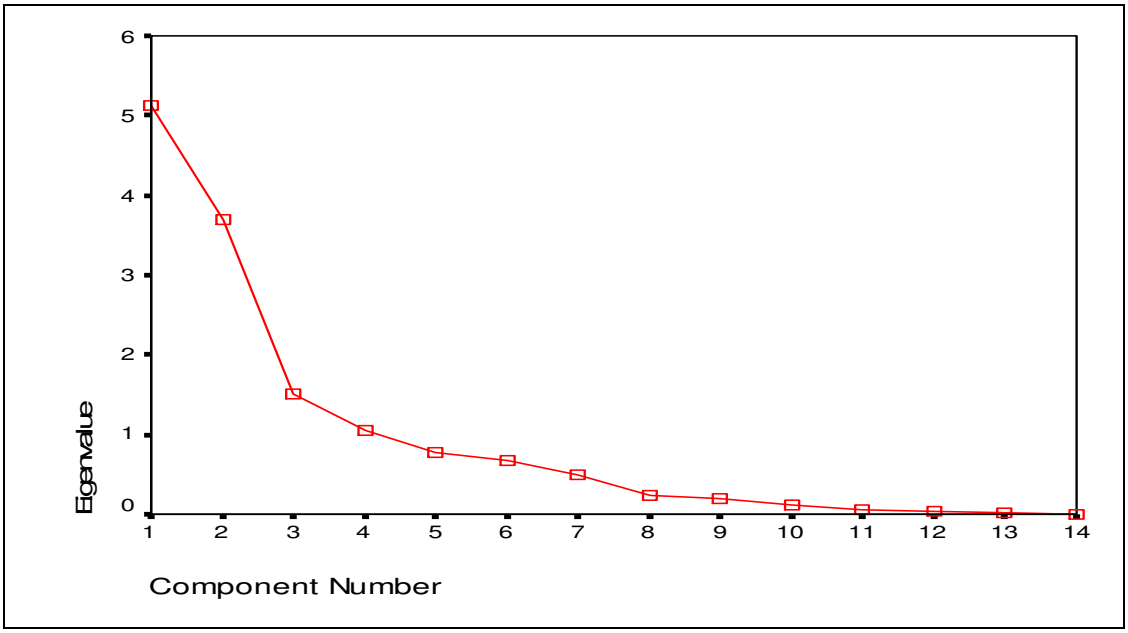

Figure 2: Scree Plot

As shown P-value = 0.000<0.05 there is correlation between the variables. This meant that we could go ahead with factor analysis.

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Table 8: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.340
Bartlett's Test of Sphericity	Approx. Chi-Square	471.76
	df	.91
	Sig.	.000

Each row contains coefficients used to express a standardized variable in terms of the factors. A factor loading of 0.5 was used to write the factor models as shown below;

F1= 0.880X2 + 0.873X5 + 0.829X10 + 0.898X13

Factor one (government policies) is comprised of: Procedures for erection of sugar factory, taxation, restriction on the number of licensed sugar factories and technology change

F2= 0.826X1 + 0.835X9 + 0.908X11 + 0.723X14

Factor two (production cost) is made up of: Reliance on rain water for production, high cost of farm inputs, means of transport of canes to the factory and traditional methods of farming used.

F3= 0.947X4 + 0.790X7 + 0.912X8

Factor three (supply of raw materials) is made up of: Delays in payment to farmers, Low prices of cane and Road network.

F4= 0.973X3 + 0.730X6 + 0.873X12

Factor four (Cheap imports from COMESA region) is comprised of: Importation of free duty free sugar, Export quota for sugar to EU and International Trade Agreement

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Table 9: Rotated Component Matrix (Varimax)

		Component			
Statement		1	2	3	4
Reliance on rain water for production	X_1	-.070	**.826**	-.348	-.177
Procedures for setting up sugar factory	X_2	**.880**	.241	.231	-.044
Importation of free duty free sugar	X_3	-.056	-.097	-.070	**.973**
Delays in payment to farmers	X_4	.075	.095	**.947**	-.029
Taxation	X_5	**.873**	.346	.322	.016
Export quota for sugar to EU	X_6	.068	.307	.210	**.730**
Low prices of cane	X_7	.110	.436	**.790**	-.077
Road network	X_8	.026	.099	**.912**	-.027
High cost of farm inputs	X_9	.074	**.835**	-.034	-.226
Restriction on the number of licensed sugar factories	X_{10}	**.829**	-.087	.174	.044
Means of transport of canes to the factory	X_{11}	.050	**.908**	.071	-.040
International Trade Agreement	X_{12}	.072	.239	.085	**.873**
Technological change	X_{13}	**.898**	-.158	-.069	-.133
Traditional methods of farming used	X_{14}	.229	**.723**	-.004	.156

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 5 iterations.

Table 9 shows the rotated component matrix analysis of the fourteen factors of sugar production which were compounded into technological capabilities, material capabilities and financial capabilities.

Table 10: ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	5.523	3	1.841	2.969	.003[a]
	Residual	19.220	31	.620		
	Total	24743	34			

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a. Predictors: (Constant), Financial Capability , Materials Capability, Technological Capability

b. Dependent Variable: Sugar production and its diversification in Kenya

P-value = 0.03<0.05 in Table 10, indicate that the study joint alternate hypothesis at significance level of 5% is not rejected. Hence there exist a statistically significant relationship between joint effect of technological capability, materials capability and financial capability on sugar production and its diversification in Kenya.

Table: 11 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.212	.801		3.137	.004		
	Technological Capability	.217	.101	.181	2.148	.001	.766	1.305
	Materials Capability	.348	.165	.377	2.110	.043	.800	1.251
	Financial Capability	.265	.112	.265	2.366	.003	.880	1.137

a. Dependent Variable: Sugar production and its diversification in Kenya

Table 11 presents the model of the study which was of the form: Y = .212 +.217 Technological Capability + .348 Materials Capability + .265 Financial Capabilities. The financial capability, materials capability, and technological capability had a positive effect on sugar production and its diversification in Kenya.

The model was significant, that is; Technological Capability β = .217 at p=.001<0.05, Materials Capability β = .348 at p=.043<0.05 and Financial Capability β =.265 at p=.003<0.05. Hence $H_{02,}$ H_{03} and $H_{04,}$ were accepted, an indication that; technological capability, material capacity and financial capacity have a significant effect on sugar production and its diversification in Kenya.

The analysis of the predetermined factors of sugar production and its diversification was done using factor analysis in respect of the three research objectives. The first objective

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was to establish the influence of factors of production on sugar production and its diversification. The second objective was to determine the effect of technological capability on sugar production and its diversification. While the third objective was to establish the effect of material capability on sugar production and its diversification and the finally the fourth objective was to assess the effect of financial capability on sugar production and its diversification.

As per the discussions below, the study revealed that there was a significant relationship between the variables of new technology acquisition, factory technology level, material capability, research and development, government policies, and sugarcane quality and quantity and sugar production and its diversification in Kenya.

The results also revealed that there was no significant relationship between the factors of traditional methods of farming used with p value = 0.153≥ 0.05, advantage of export quota for sugar to European Union and international trade agreements which had a p-value = 0.73 ≥ 0.05 when tested 5% acceptable significance levels.

Conclusion

The results of the study showed that the three main factors affecting sugar production and its diversification in Kenya were government policies, factory technology level, new technology acquisition, material capacity, research and development and sugar cane quality and quantity.

Stakeholders in the industry should facilitate accessibility to affordable long term finance to sugar factories and cane farmers enhanced performance. The Kenyan government should also review the current double taxation policies of the sector. These initiatives directly contribute to promotion of sugar production and diversification into related products from the core product. This initiative will improve the industry profitability and give a competitive advantage for both domestic and global markets, guarantee sustained growth and good returns to all the stakeholders.

The sugar processing factories should reduce material costs through improve on the supply of the raw material (sugarcane) to meet crushing capacities. Sugarcane development programmes should be introduced where factories advance cultivators with farm inputs like supply of early maturity seed cane (D 8484, EAK 73-335, KEN 82-62, KEN 83-472, and KEN 83-737), fertilizers and farm preparation services. Agricultural extension expertise on good crop husbandry is also essential in development of quality sugarcane farming. The factories to leverage on new technology and strategic alliances for cost control and sustainability.

For Kenya to compete favorably with its Common Market for East and Southern Africa States, the government should consider harmonizing its taxation policies and introduce investment subsidies to match with other COMESA partner states; provide necessary infrastructure, and construction of sugar industry spare parts manufacturing

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factory. Presently, the industry imports its spare parts requirements from the Middle East and Europe countries, these accounts for 10% of sugar production overheads. The sugar industry should maximize its performance through utilization of existing capabilities and diversification strategies for desired competitive advantage.

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